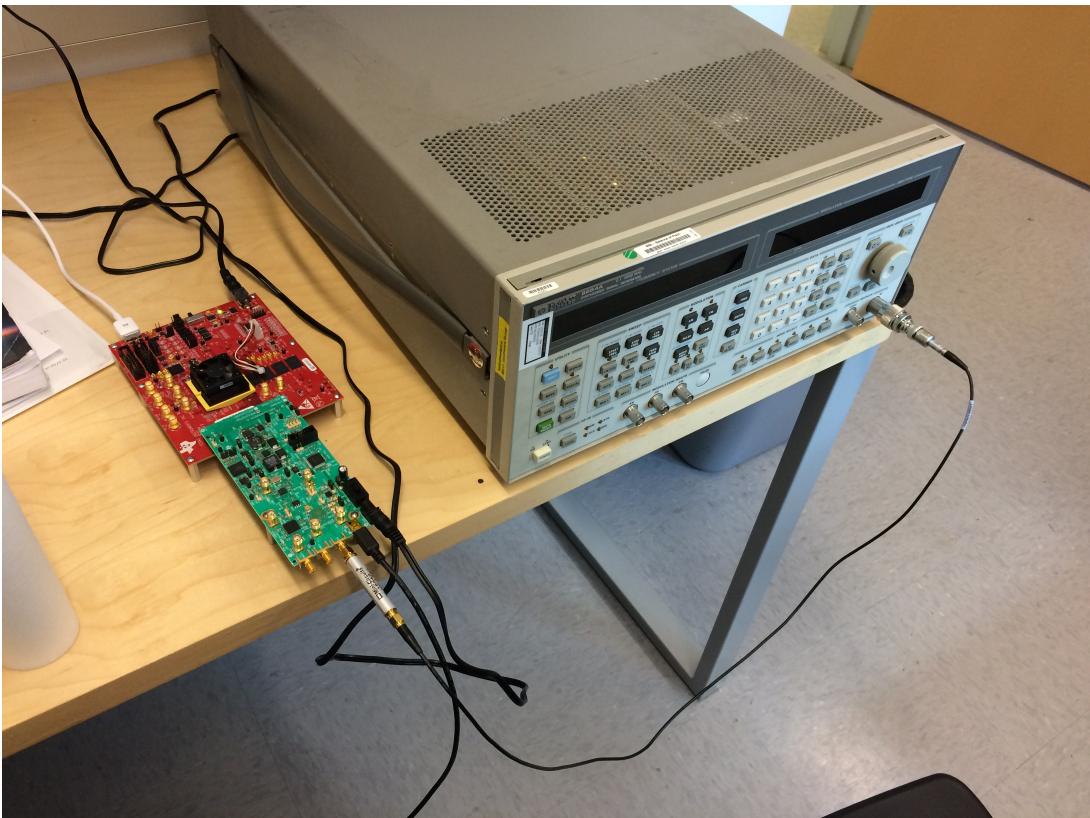


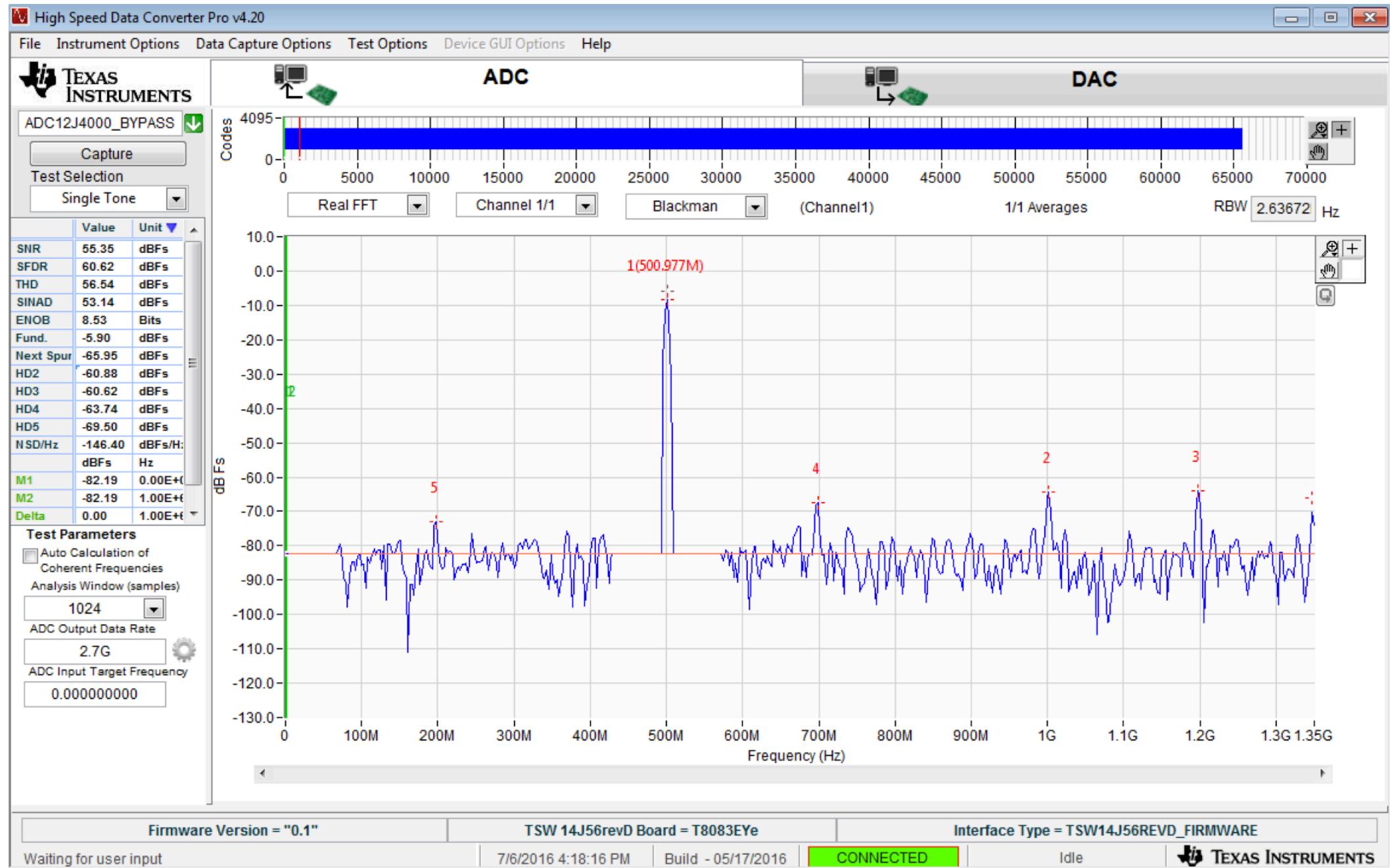
“The Hose in Slow Motion”

BMX Data Acquisition Simulations

ADC Setup

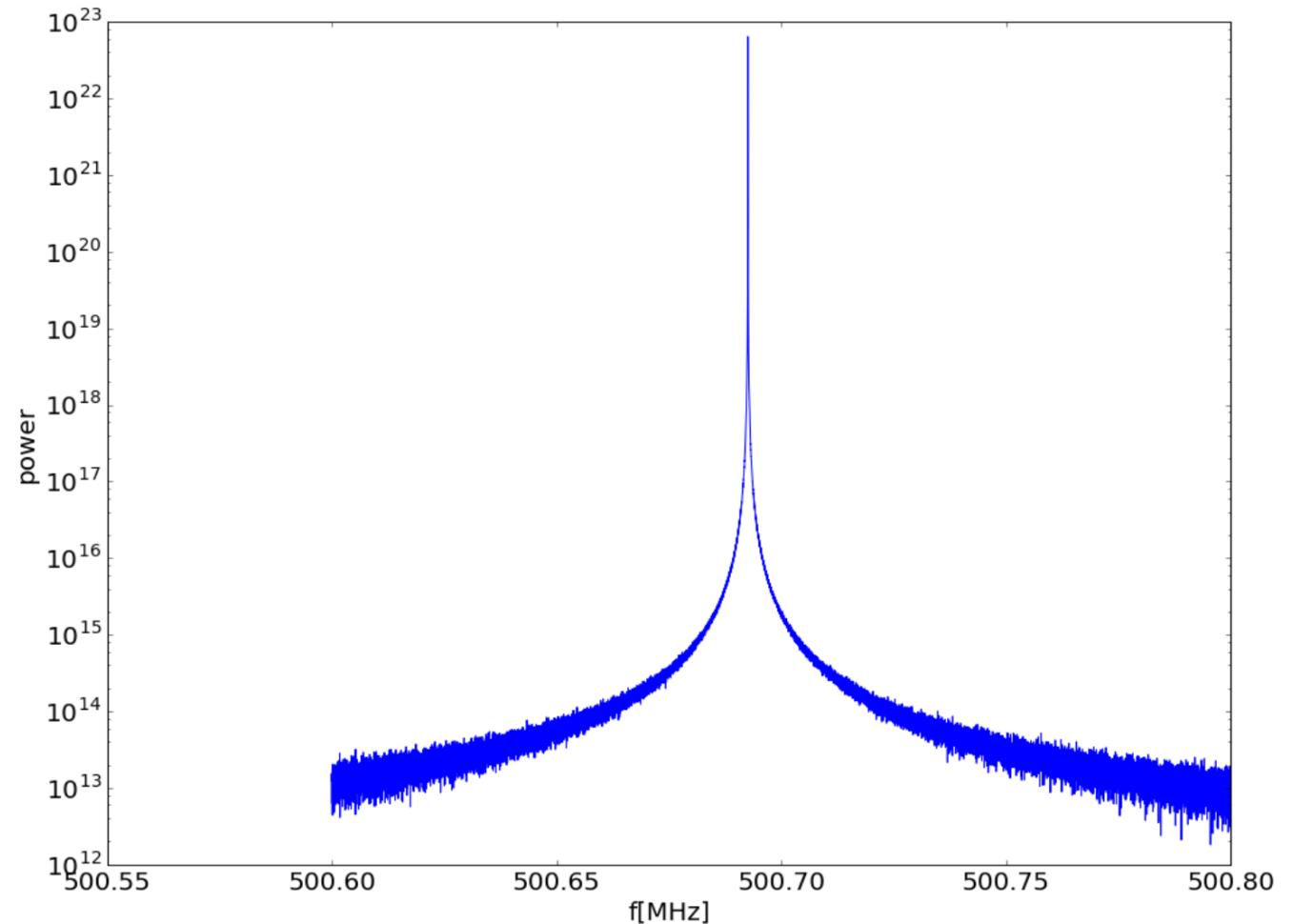


- Tone generator creates a signal with frequency ranging from 10KHz-3GHz.
- ADC samples the signal at 12 bit resolution and 2.7GSamples/s and saves a short chunk of data into a .bin file.
- Signal can be seen through software.



Isolating Frequency Peaks

- ADC file read in as .bin, converted to array, then Fourier transform is applied.
- The peak of the signal is then isolated.
- Resolution about $\sim 1/\text{total time}$.

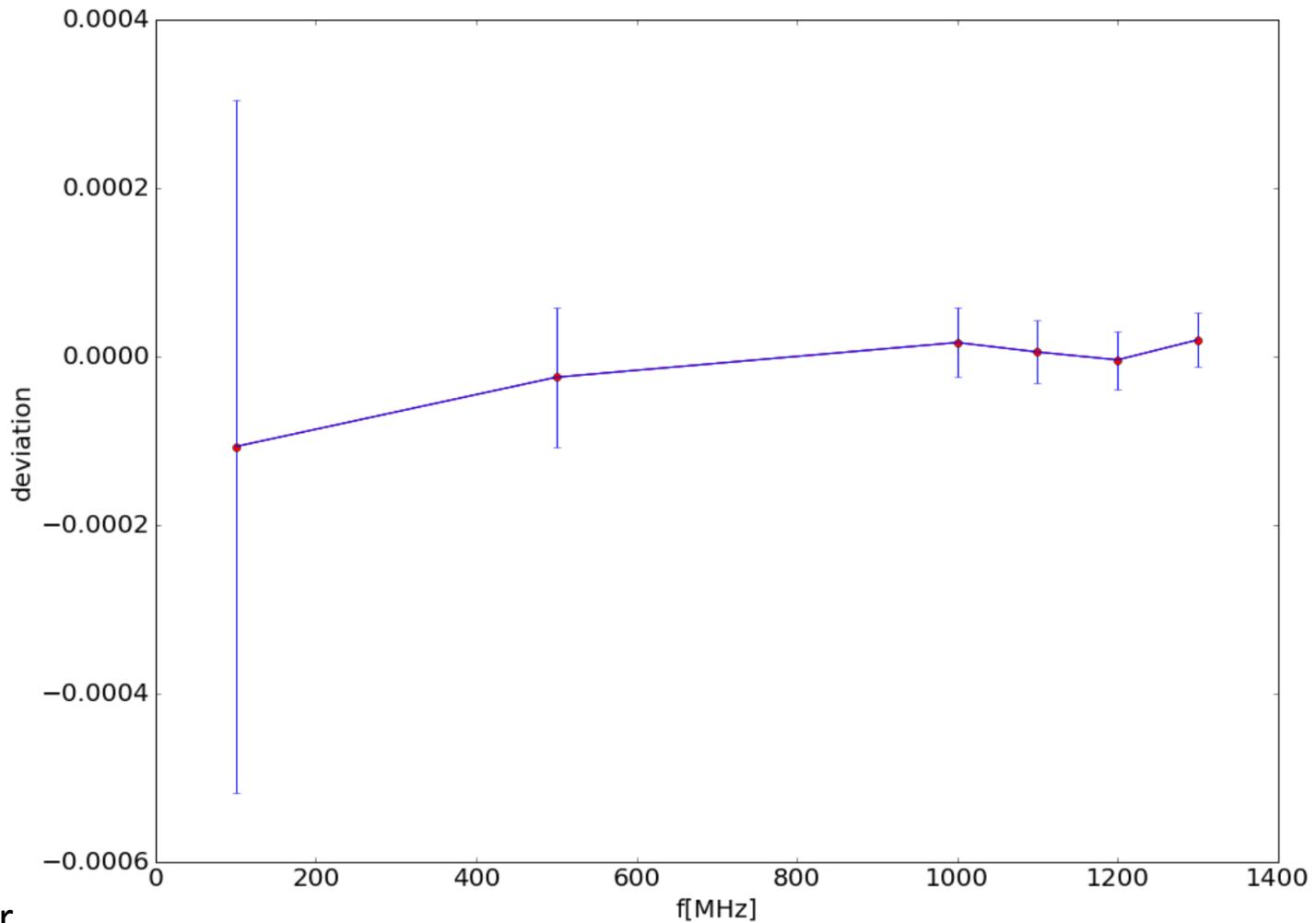


Frequency ratio

- Ratio between what is entered into tone generator and what is computed through Fourier.
- Given by:

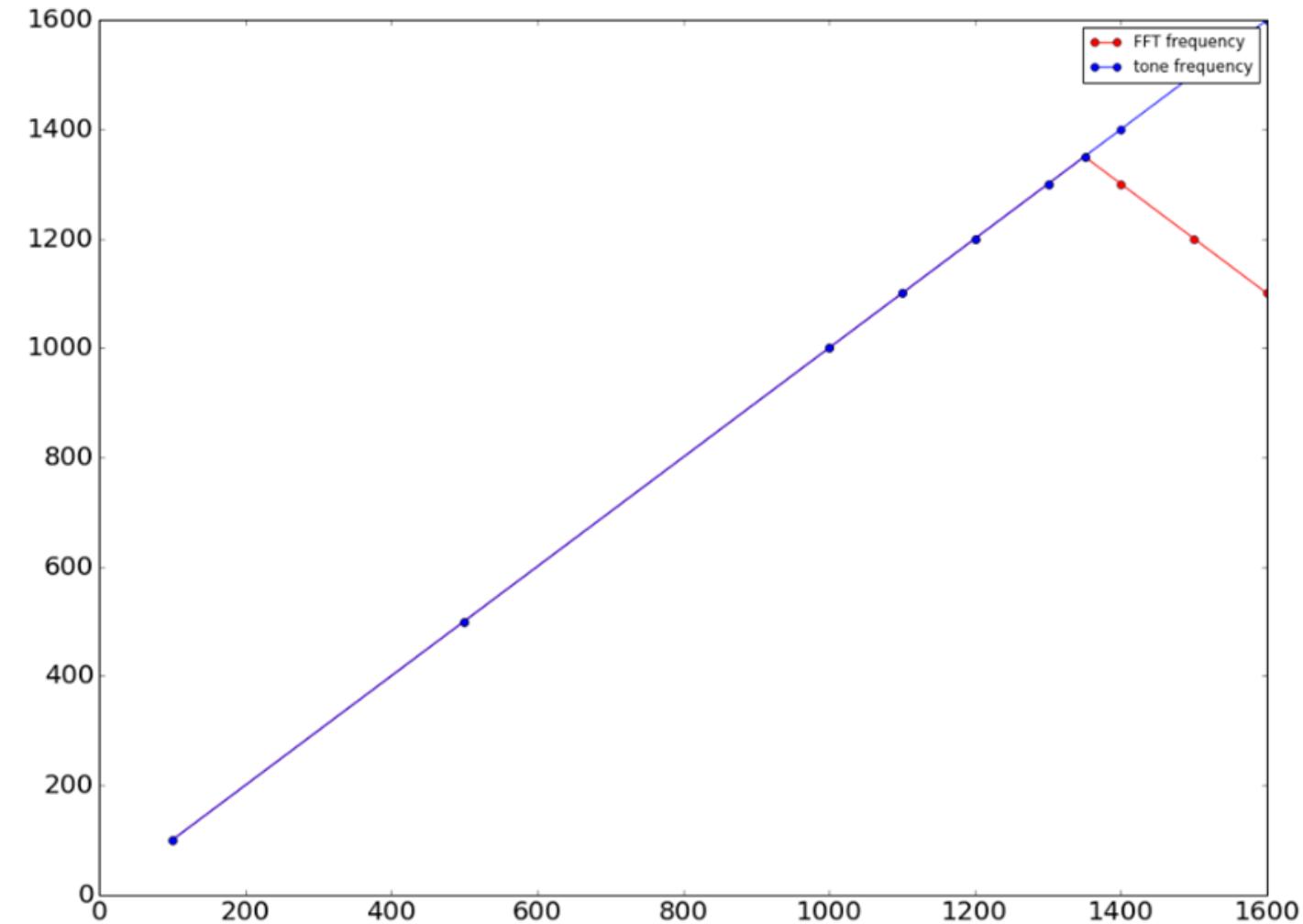
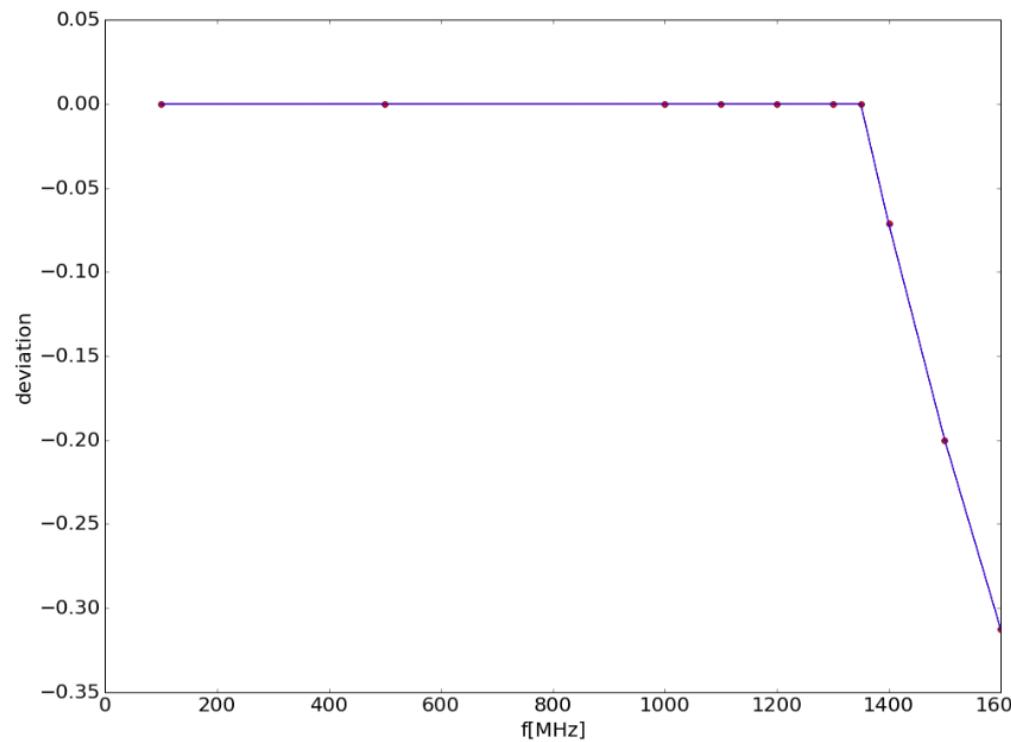
*Fourier freq calc./Tone
input - 1*

500.00000000 +/- 4.119873046875e-05
ratio 1.91103729152e-06 Error bar
Tone input



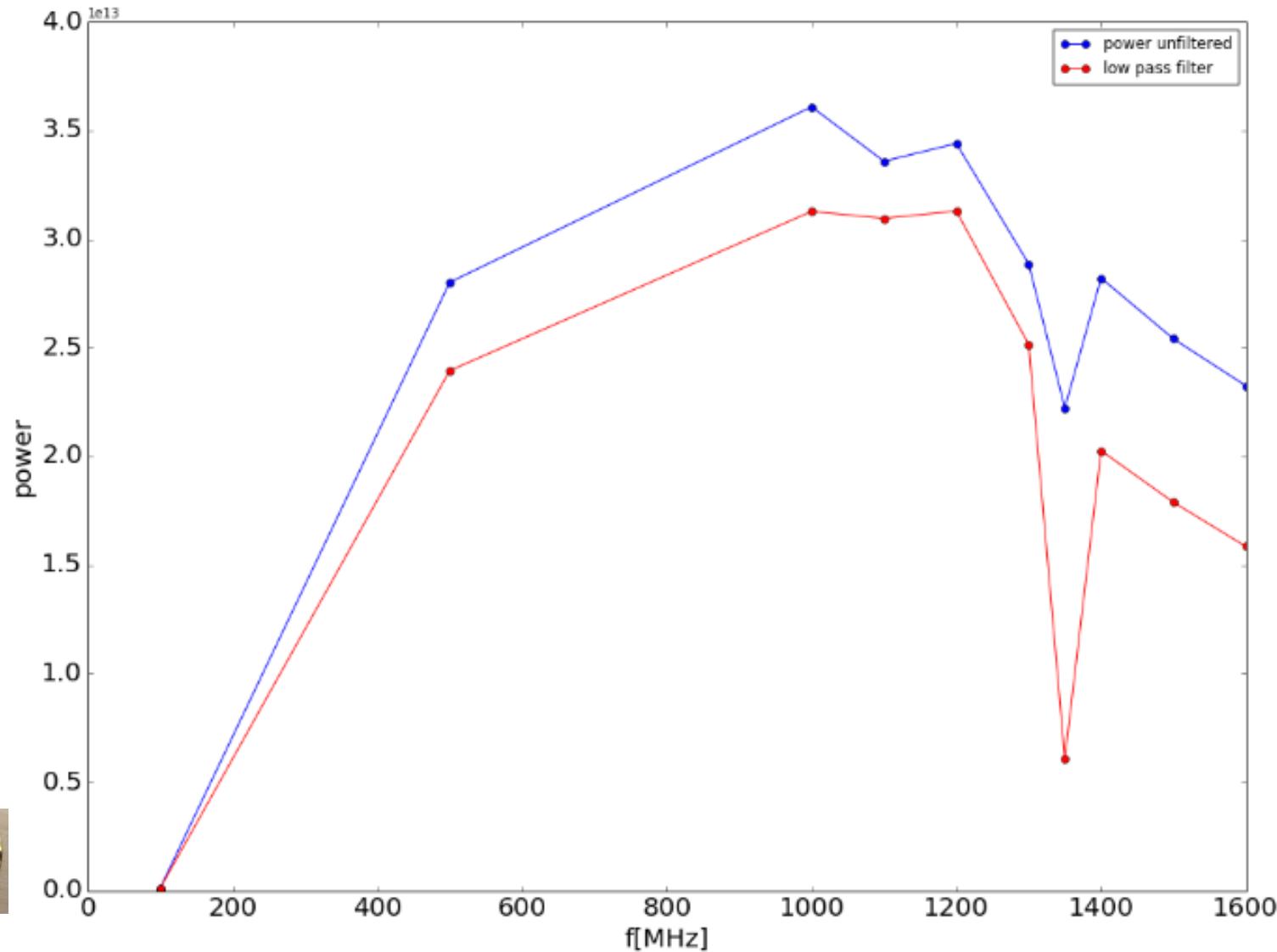
FFT Frequency v. Tone Frequency

- The large deviation is not a deviation; it is aliasing



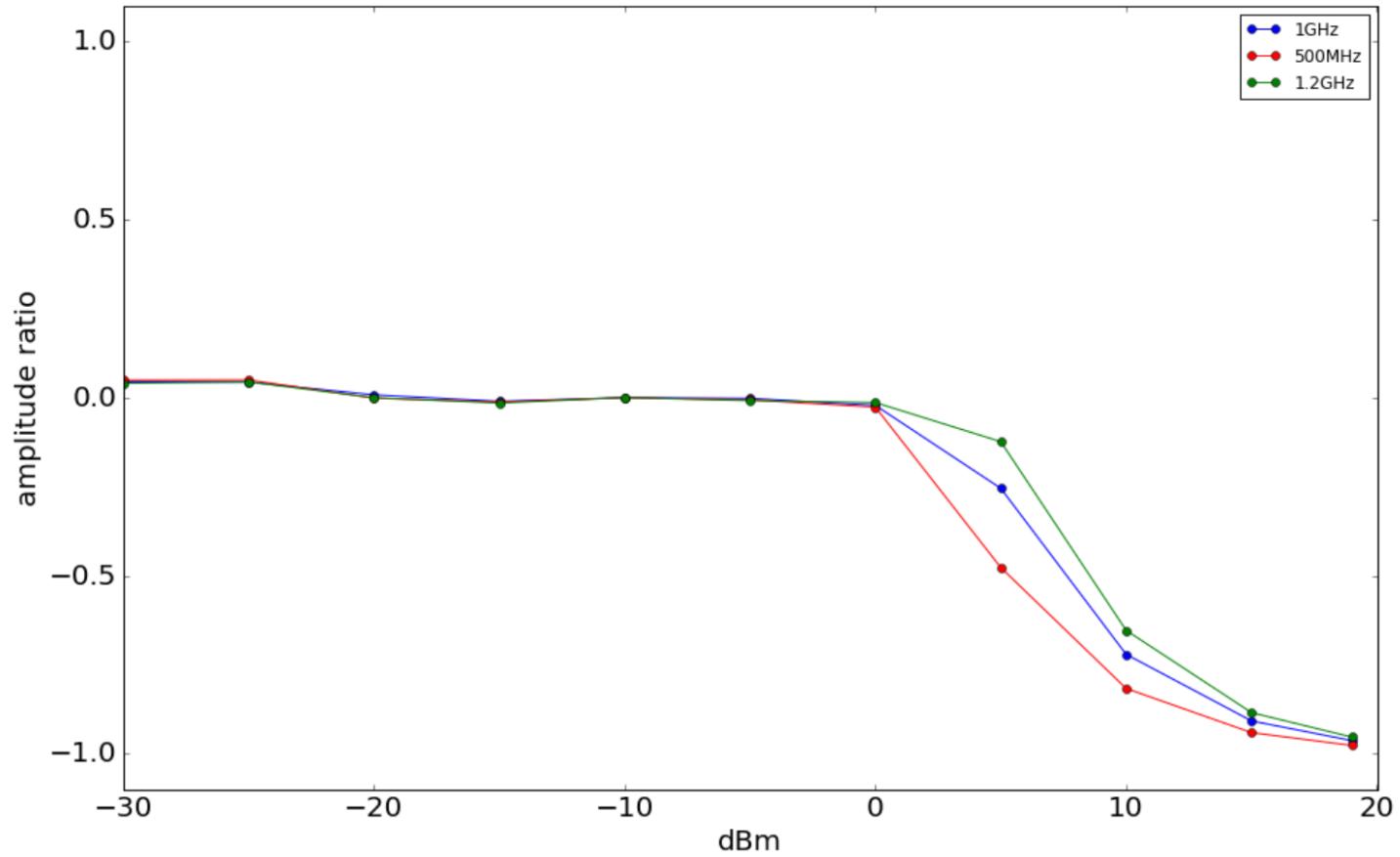
Low Pass Filter

- A low pass filter of 1350MHz, with 40.0 dB rejection was tested.
 - Although some filtering seems to take place, the power is not reduced substantially.



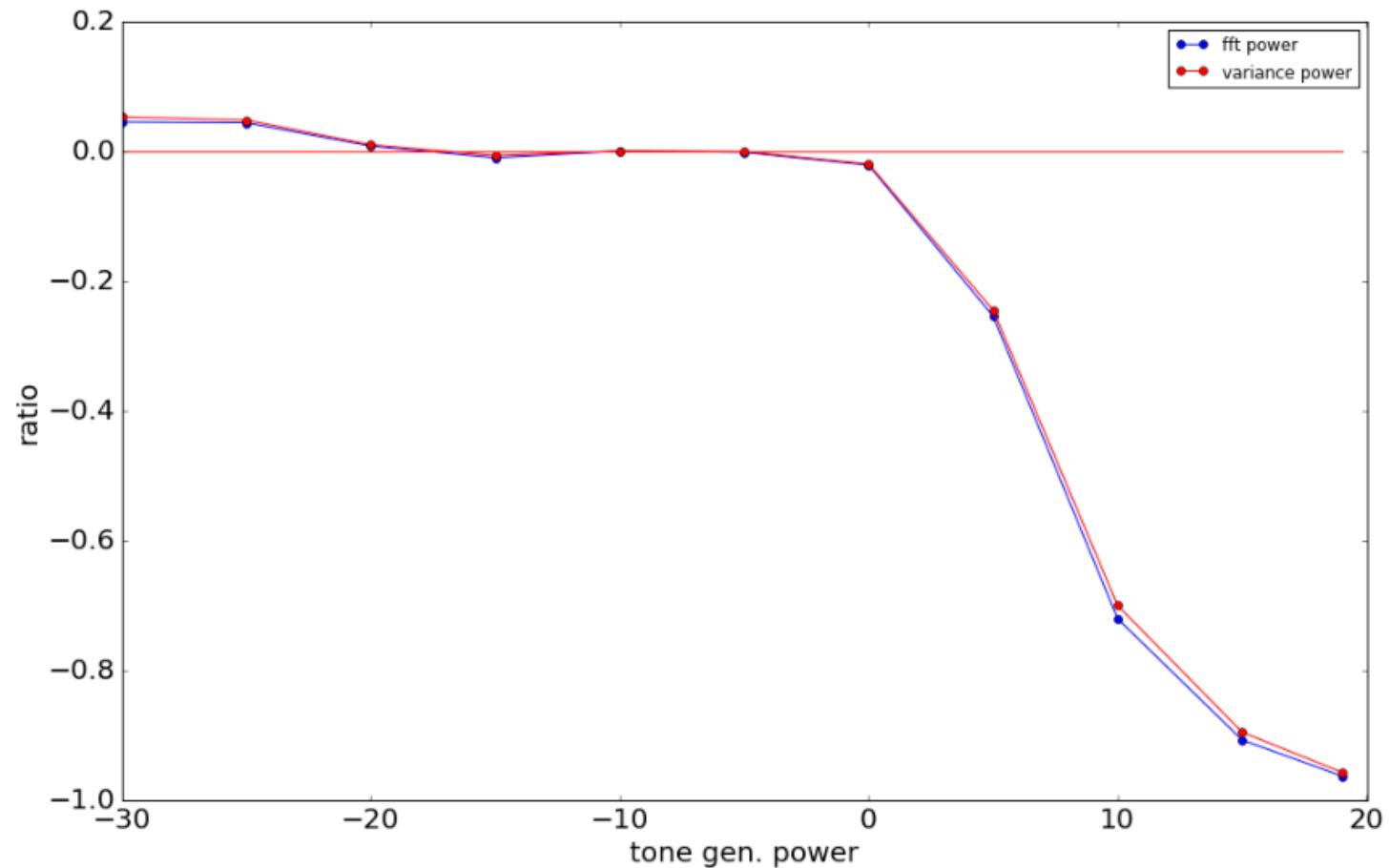
Amplitude Ratio

- Amplitude of 500MHz, 1000MHz, and 1200MHz compared.
- Suppression at high end due to reaching the dynamic range of ADC.
- Curious 5% differences at low end.



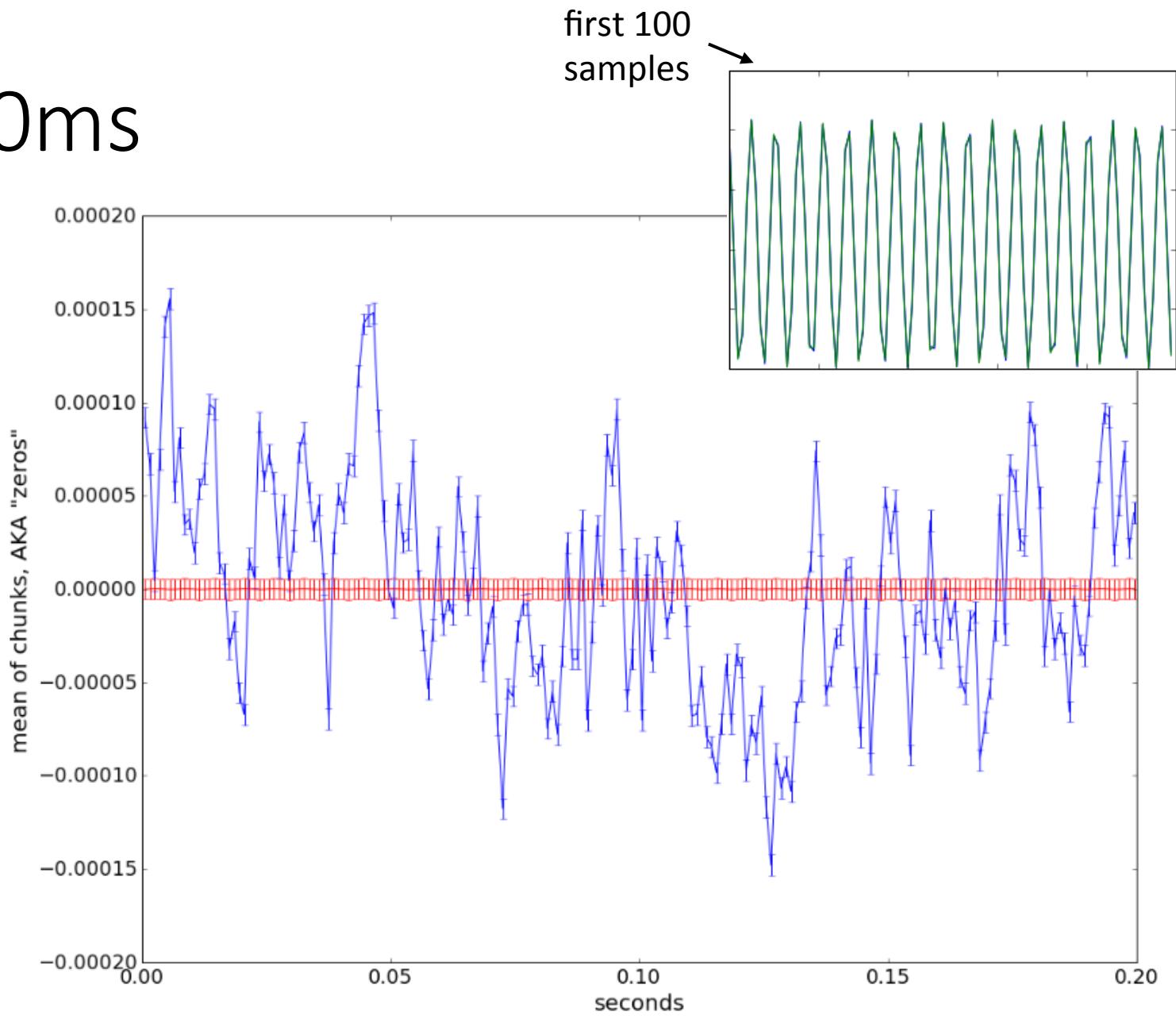
FFT Power v. Variance Power

- ADC noise not responsible for 5% differences.
- FFT power shows power for a specific frequency.
- Variance power shows the total power integrated over all frequencies measured.



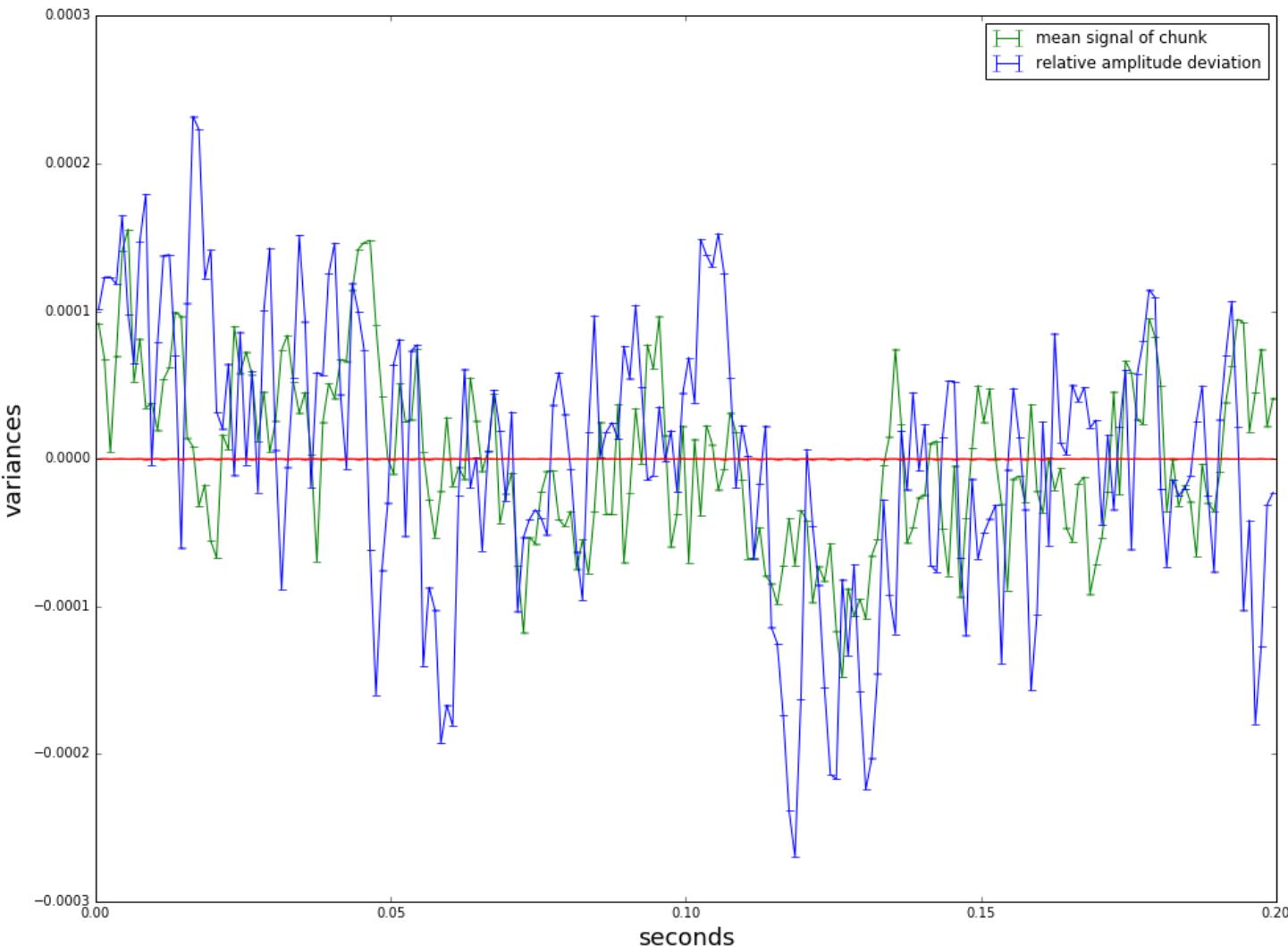
500MHz Tone- 200ms

- Data chunked into 200 pieces.
- ADC's frequency waves are NOT centered at zero.
 - The global mean is designated as the “zero”.
 - Mean of chunks should equal this “zero”.

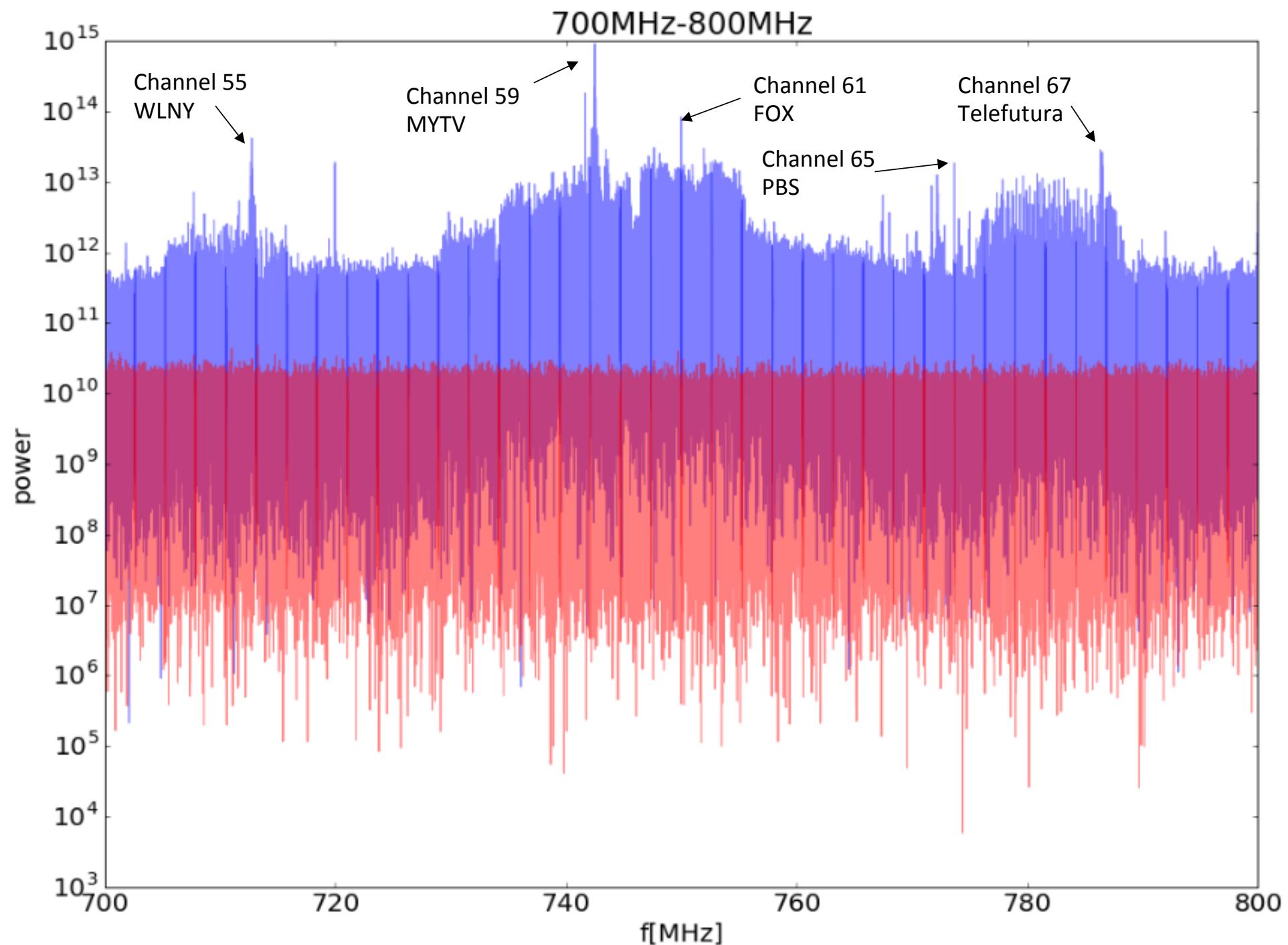


500MHz Tone- 200ms

- The mean signal of each chunk and the relative amplitude deviation roughly track each other, but not exactly.
 - ADC has small 1 part in 10,000 slow fluctuations in amplitude and variance response.

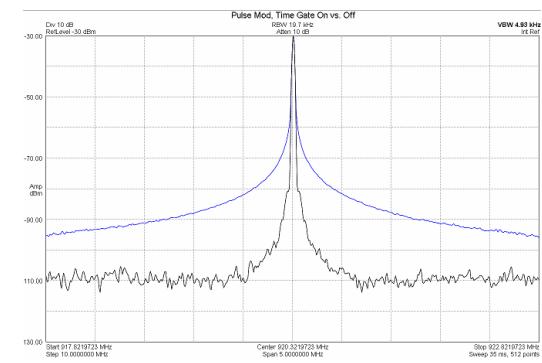


Antenna Frequency Spectrum



Beam Test Setup

- Tone generator set to specific frequency and highest amplitude.
- Receiver angled different ways to map beam.



Beam Test Analysis

- The antenna was angled horizontally and vertically, sweeping 90° left and right.
- Reflections made measurements not very reliable...

